Lecture

Module 11: Spatial and Temporal Characteristics of Landscapes

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Learning Objectives

Upon completion of this module, the participant will be able to:

1. Describe time scale and size scale elements of landscape features.

2. Compare and contrast the biological diversity between small patches of relict native communities with large patches of the same community.

3. Describe habitat fragmentation and how it affects biological communities.

4. Describe how temporal and spatial considerations can be integrated into landscape planning and habitat restoration efforts.

5. Appreciate the importance of considering historical ecological conditions when evaluating current conditions or predicting future conditions.

Lecture Outline

Landscapes operate on both spatial and temporal scales
Spatial considerations
    Species-area relationships
    Heterogeneity and complexity
Temporal considerations
    Historical reconstruction
    Ecological processes
    History of the Willamette River Valley
Restoration
    Prioritization
        Ecological response
        Socioeconomic considerations
    Developing alternative futures
    Principles and concepts

Risks
Evaluating success: persistence vs. disturbance
Timeframe
Learning and changing
Application of historical perspectives
Context
Management questions
Dealing with uncertainty and knowledge gaps

Exercise

1. The ecological and cultural processes that occur at multiple scales in time and space are enormously complex. In efforts to consider all of the ecological interactions, the economic realities, the cultural constraints, and the trends in population, people often become daunted by the complexity of all these issues. To make things even more difficult, data are often scant, and information gaps make us wary of moving ahead on decisions that may affect our natural resources and/or our ability to make a living on our land. Often the most complete information we have is that of past conditions. Discuss why the reconstruction of historical conditions of landscapes can be helpful in making decisions for future actions.

Study Questions

1. How does the degree of complexity or heterogeneity of habitats affect overall species diversity or richness at different spatial and temporal scales?

2. What is policy fragmentation? Give an example of natural resource policy fragmentation in your area and how it affects your landscapes?

3. How do intact riparian forests contribute to conservation of aquatic communities? What are some important spatial and temporal considerations relevant to management of riparian areas of streams and rivers?

4. What are some of the most common practices used to stabilize riverbanks and how do these practices affect floodplain processes and river dynamics?

5. Why is an understanding of historical ecological conditions important when making sound land management decisions?

6. What is a species-area curve? How does the relationship between species richness and habitat area influence the design of conservation measures? What are the implications of this concept (or the concept of species-distance curves) for aquatic conservation? What are the implications for terrestrial habitat conservation?

References and Selected Reading

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Slides used in lecture

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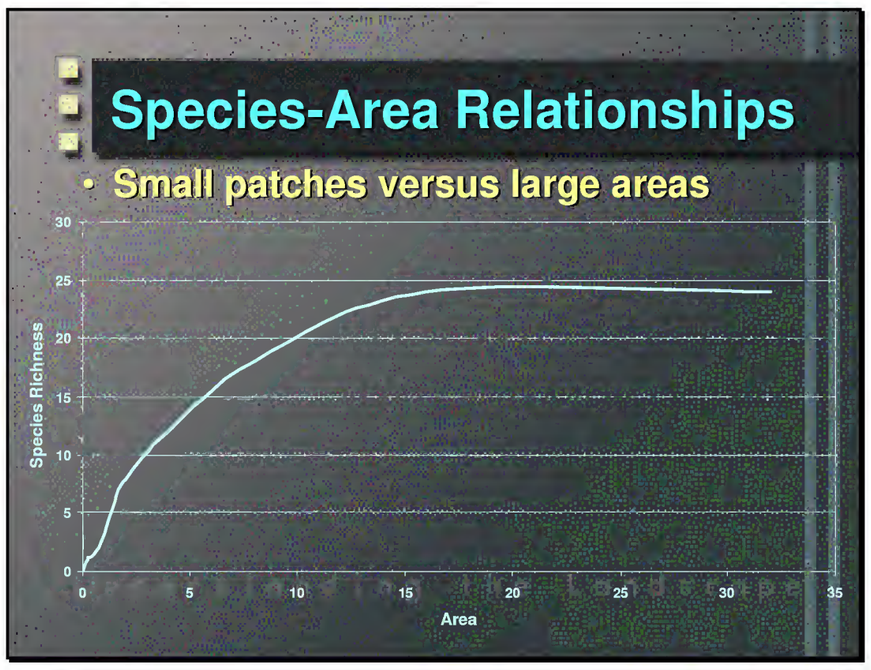

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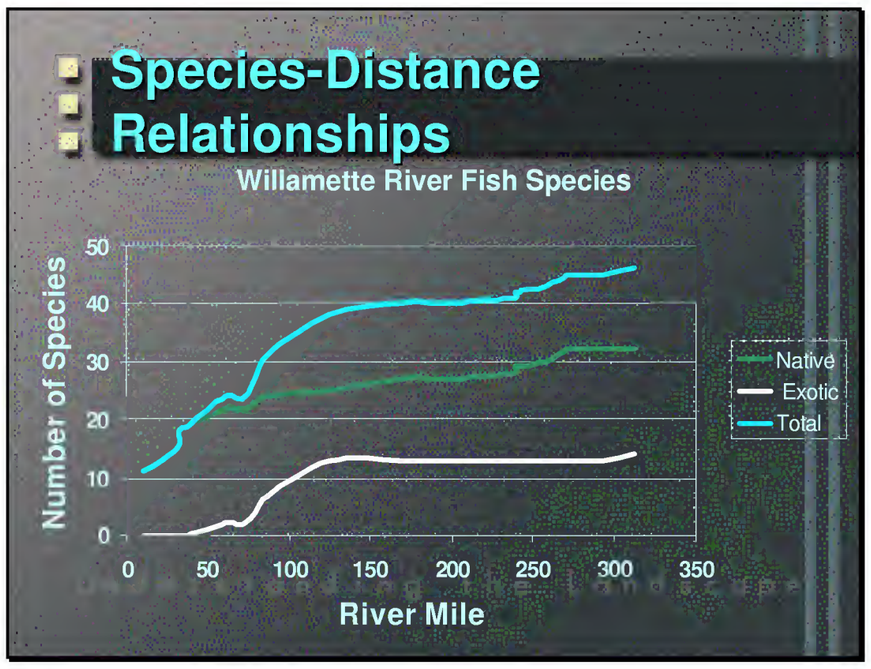

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Policy Fragmentation

- Riparian Reserves on National Forest Land
- Buffers on private forest land
- Voluntary farm plans on agricultural lands
- Few limitations on residential lands
- Extreme modification of industrial and urban lands

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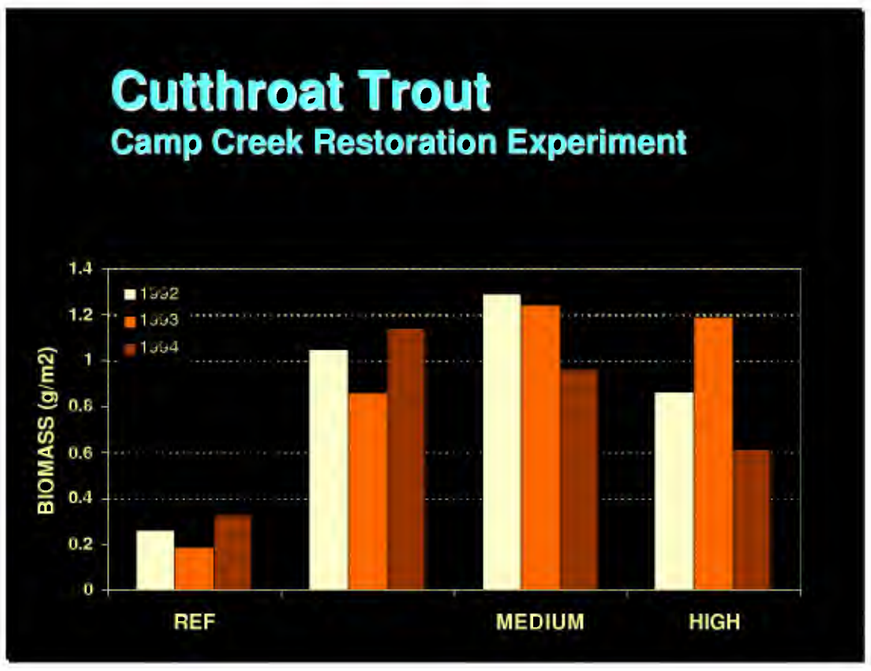

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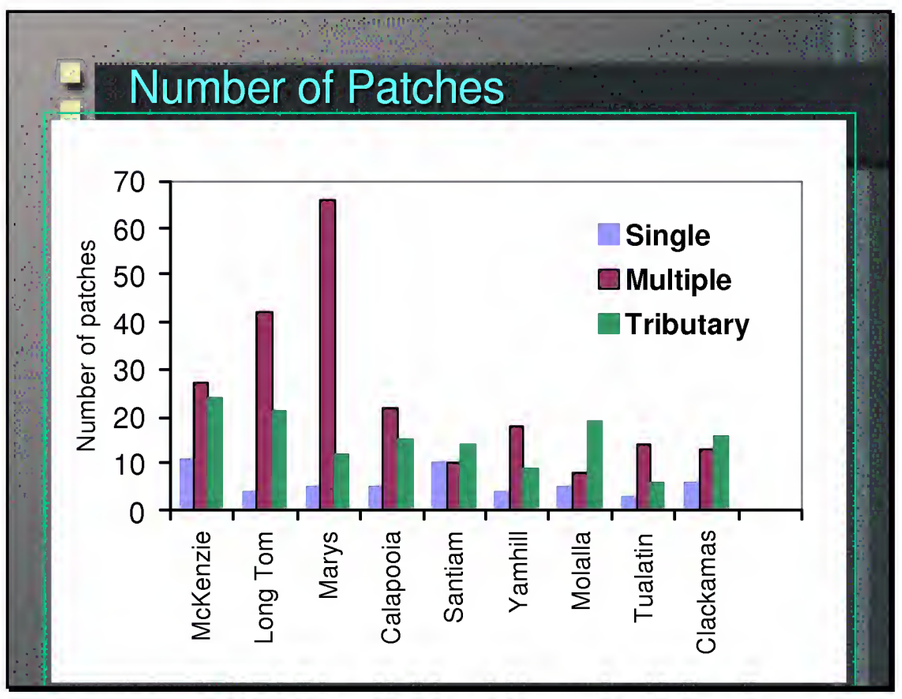

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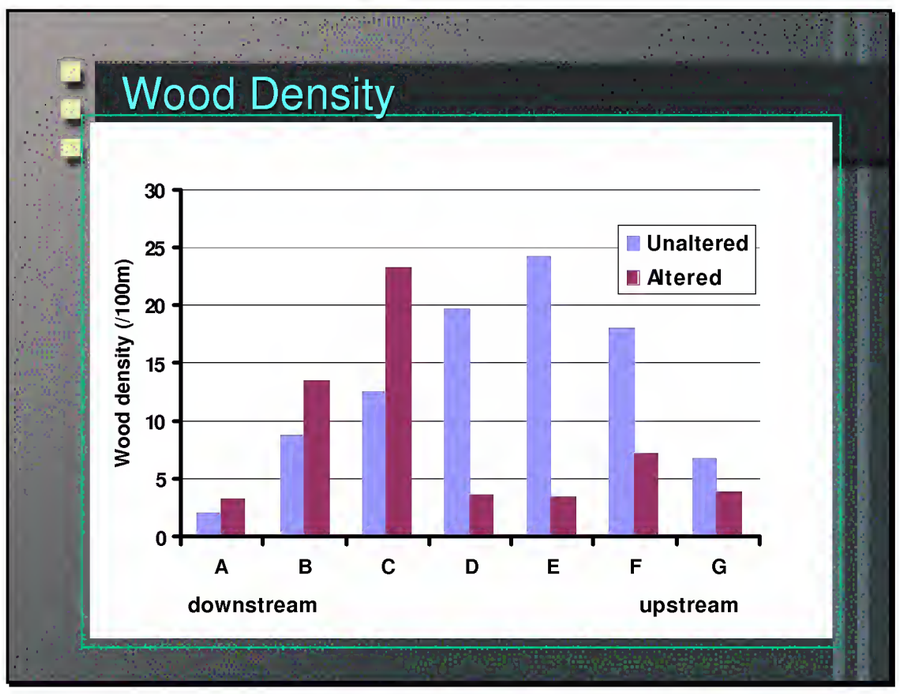

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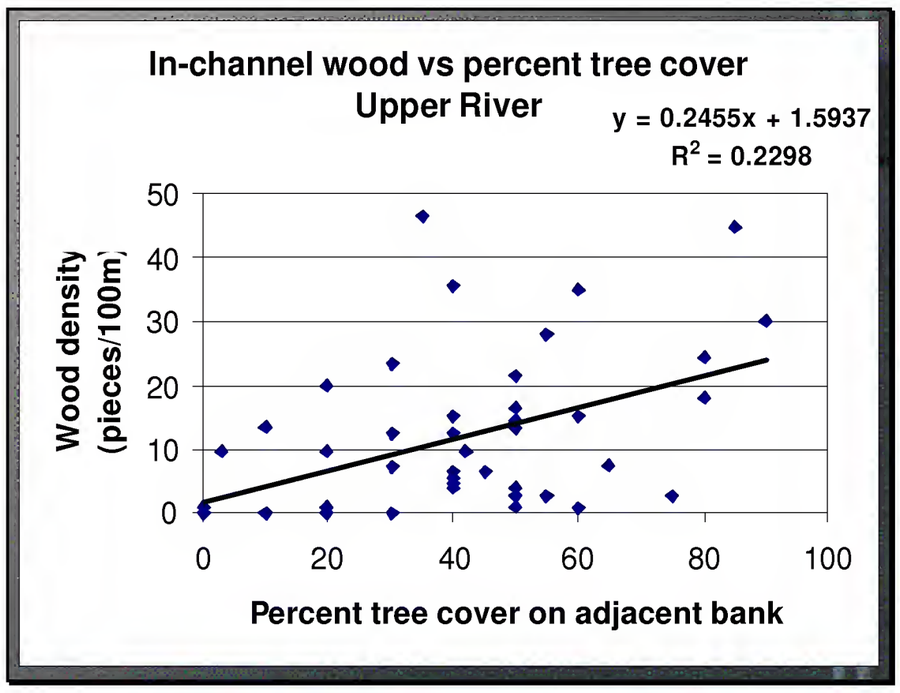

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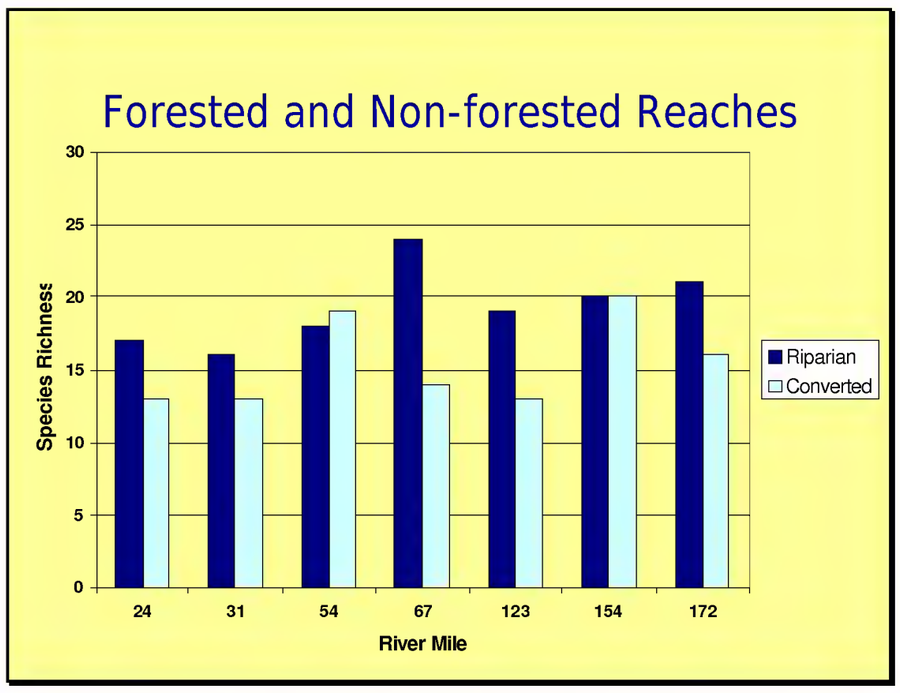

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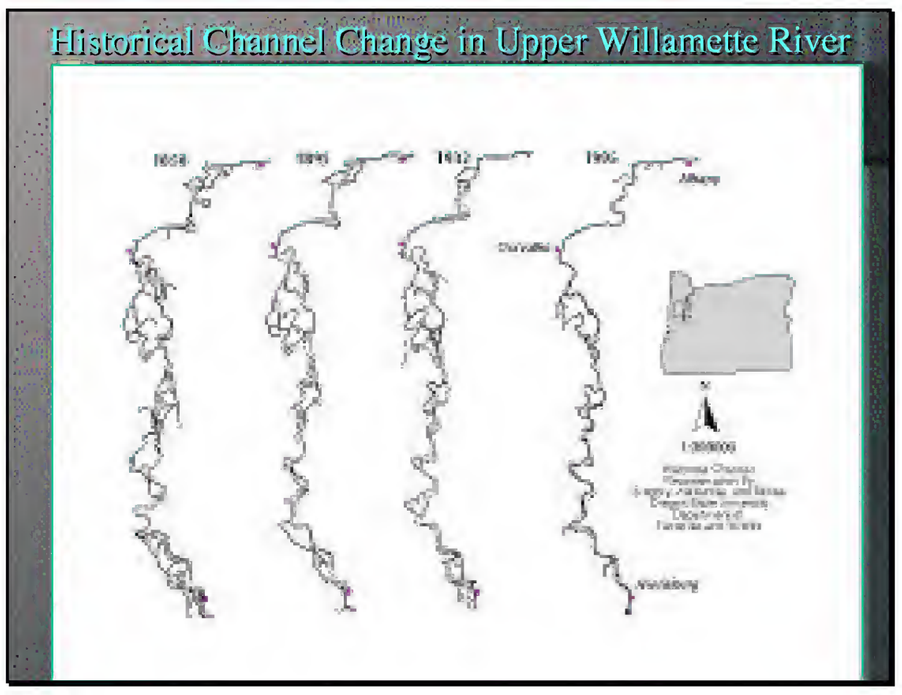

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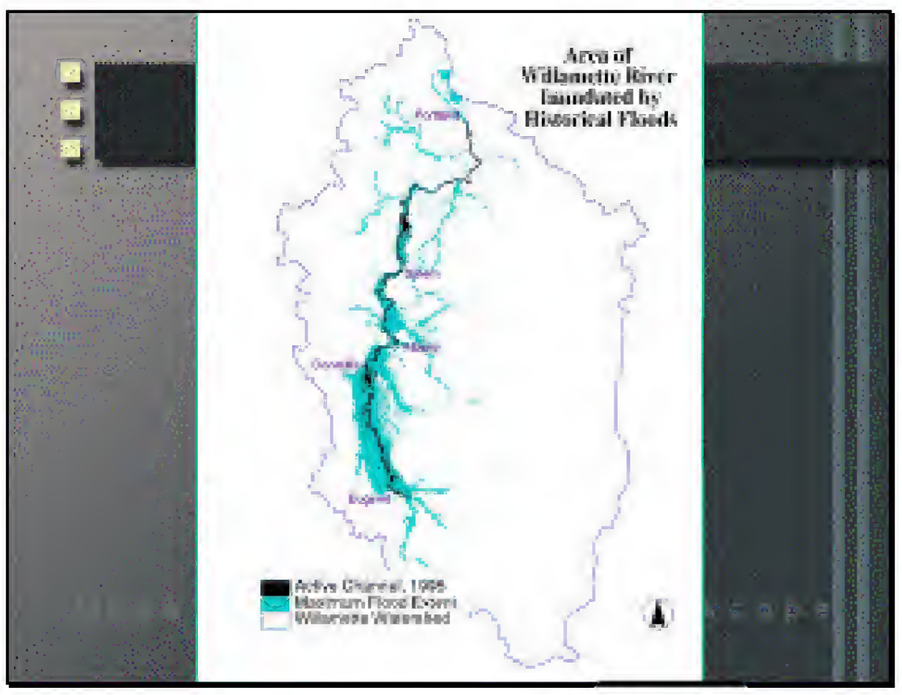

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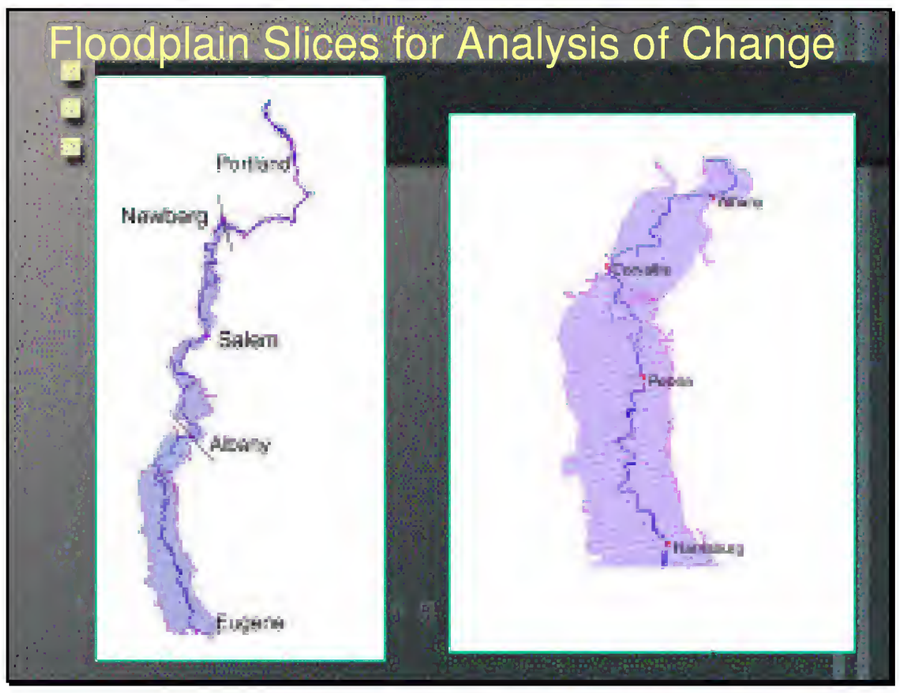

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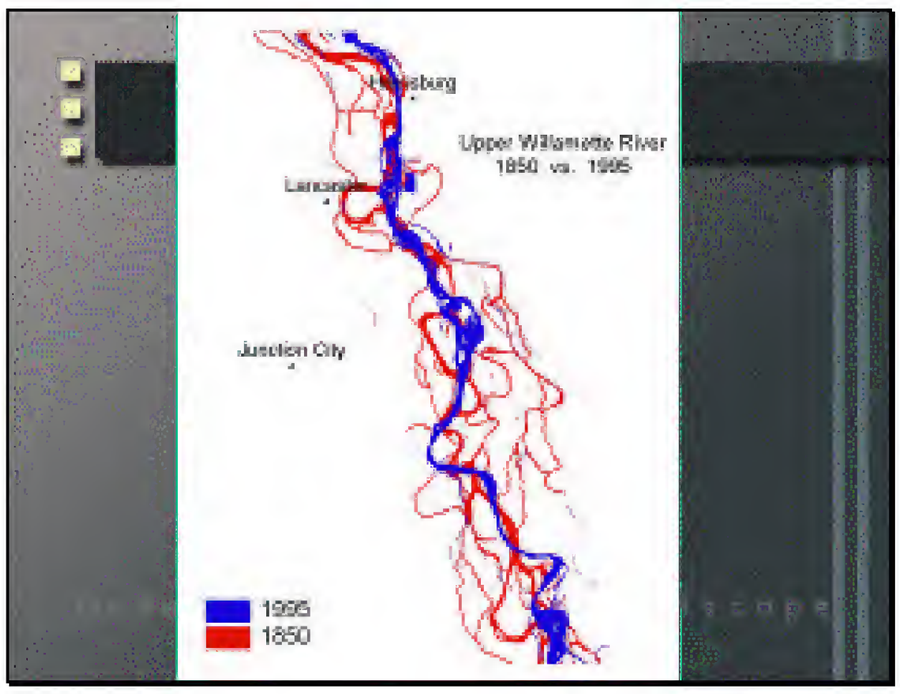

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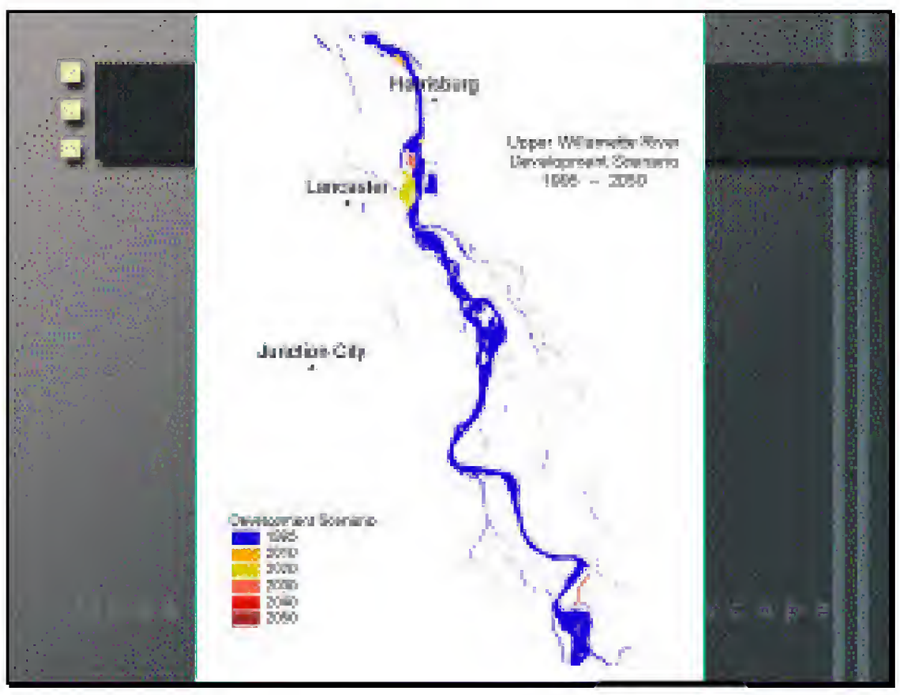

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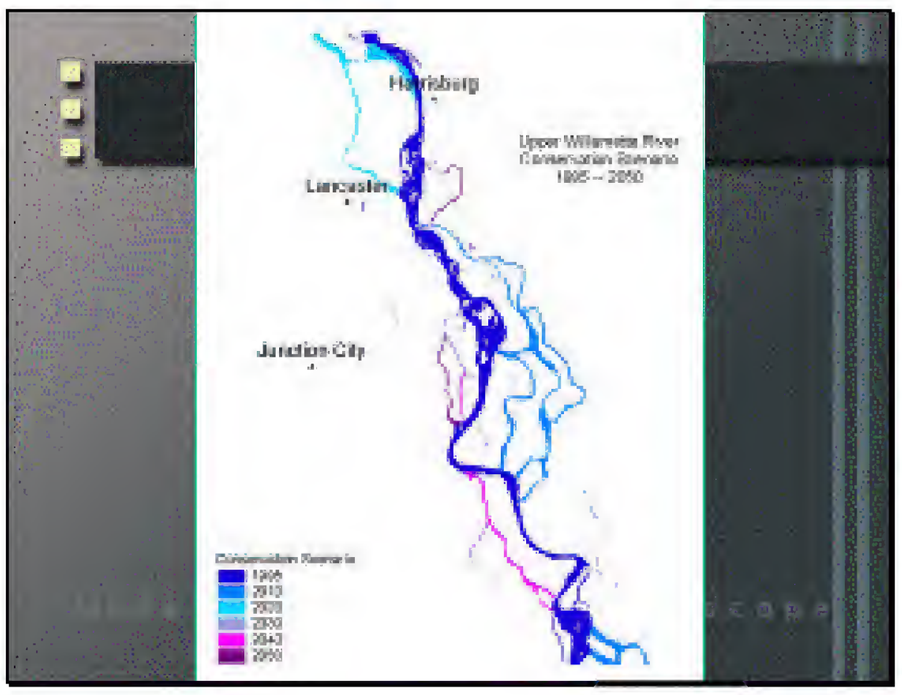

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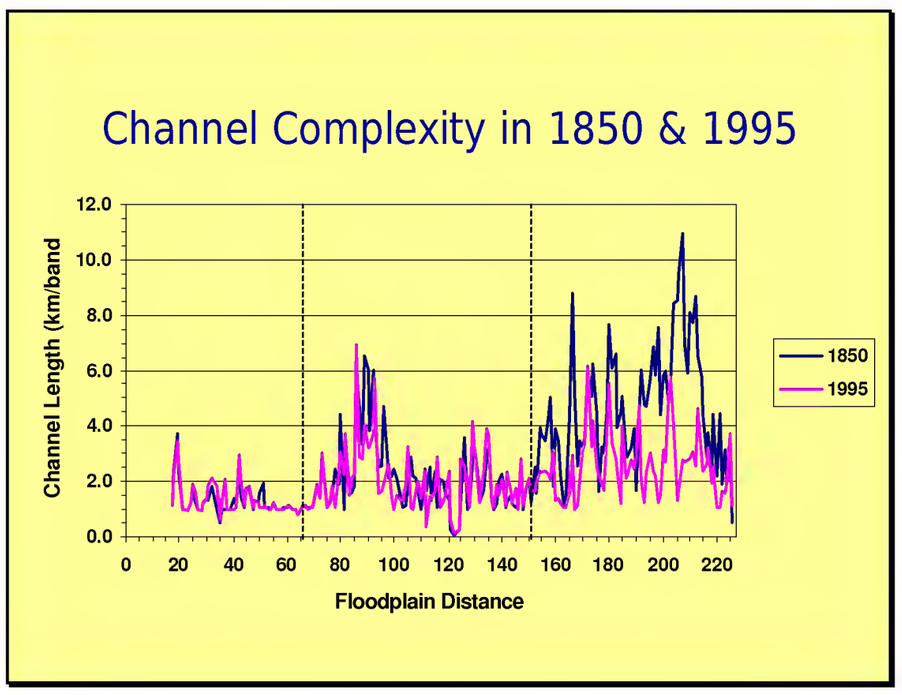

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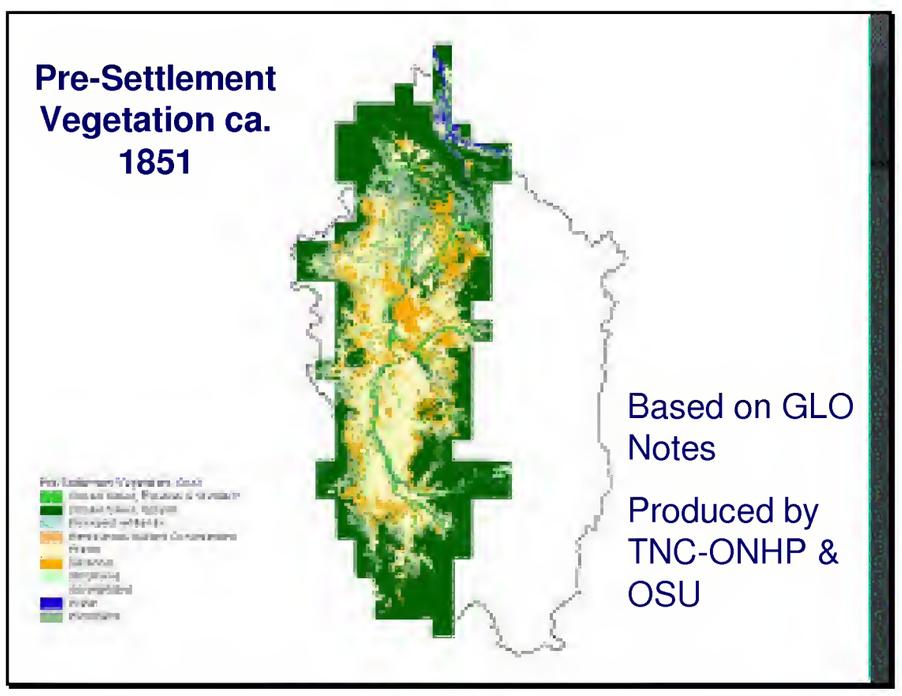

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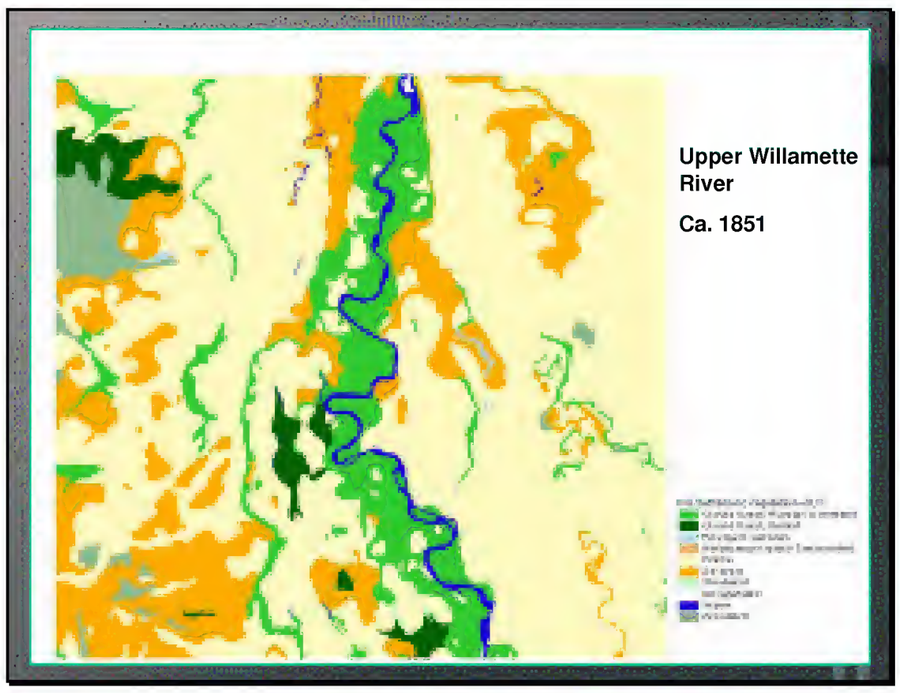

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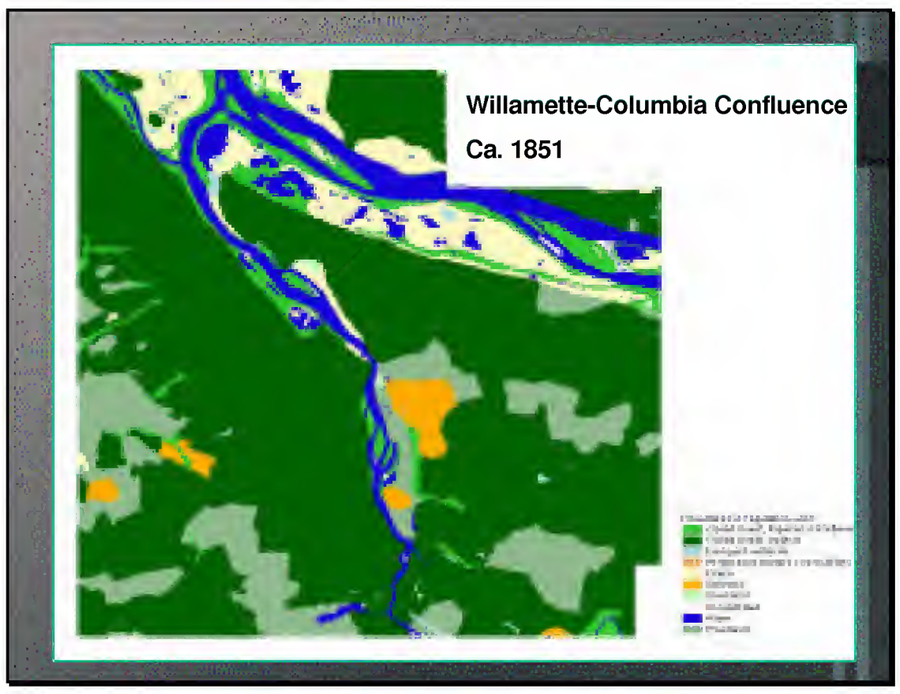

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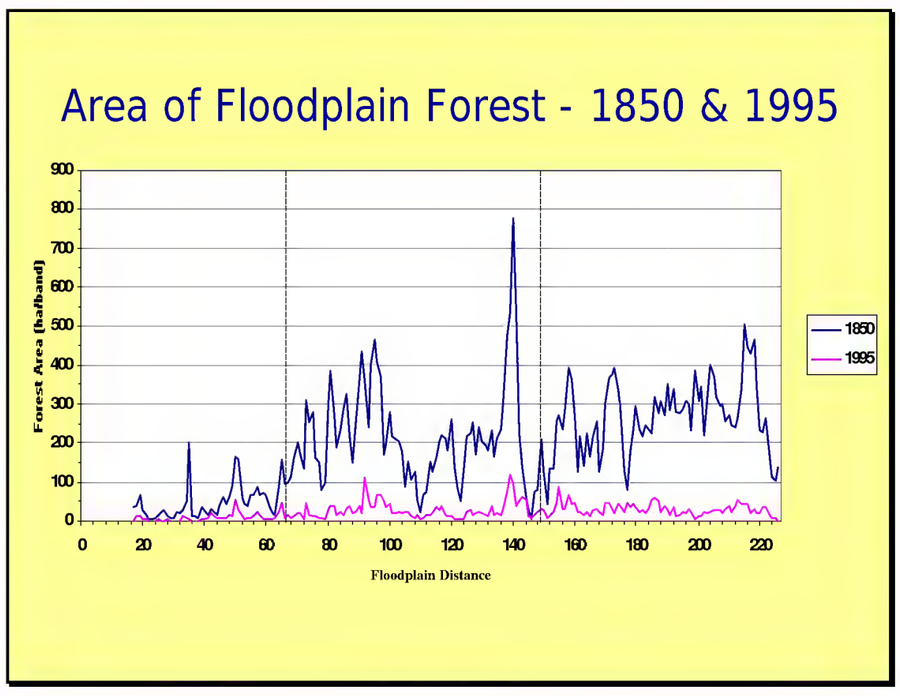

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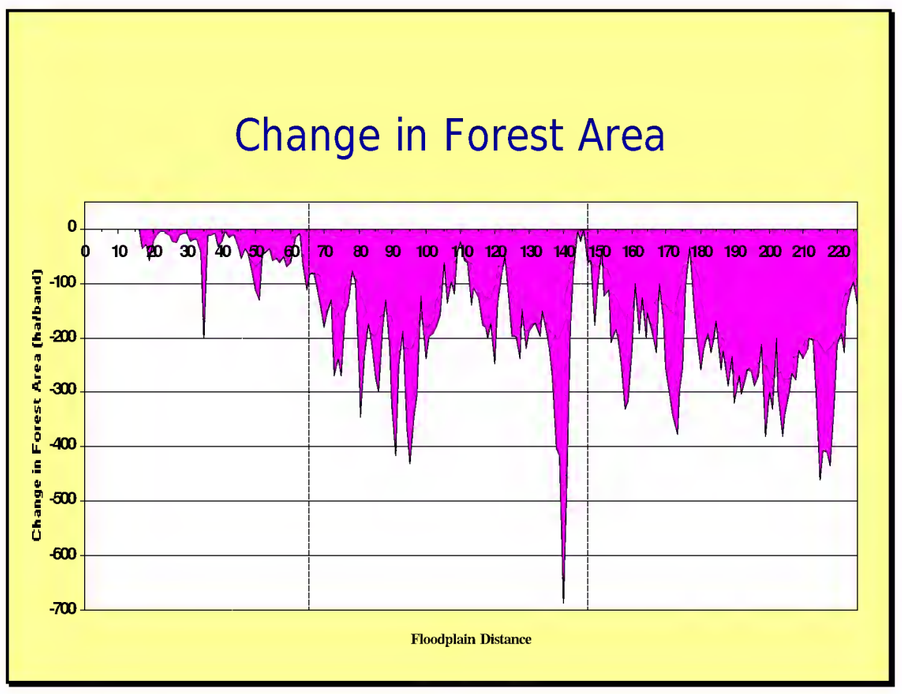

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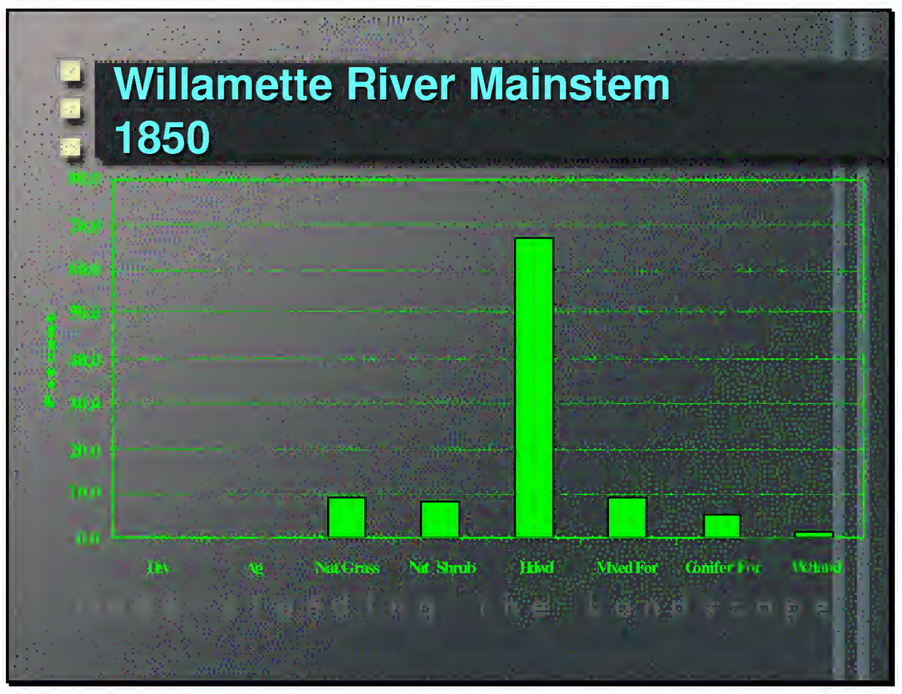

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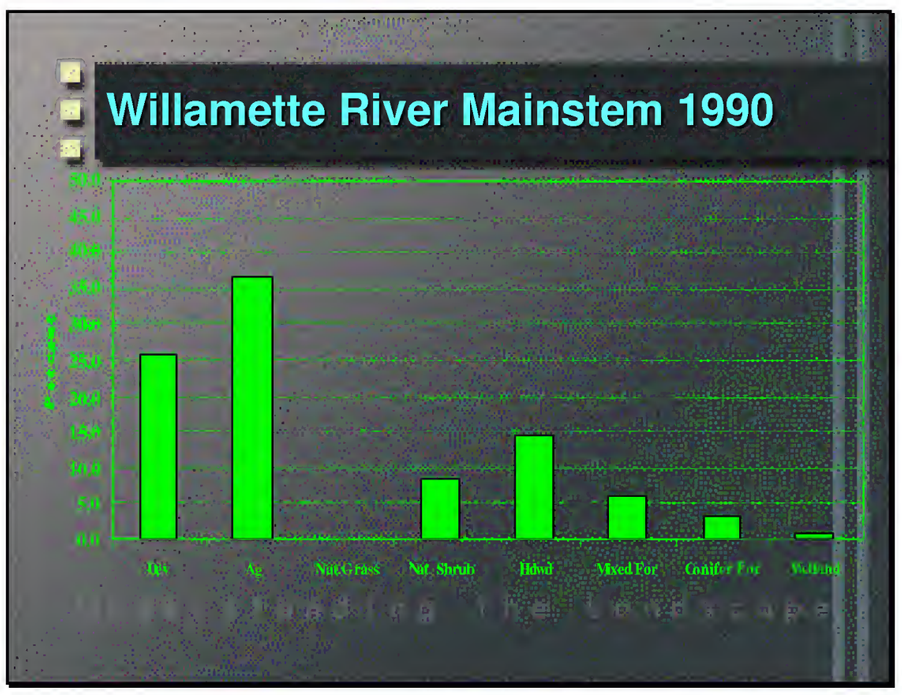

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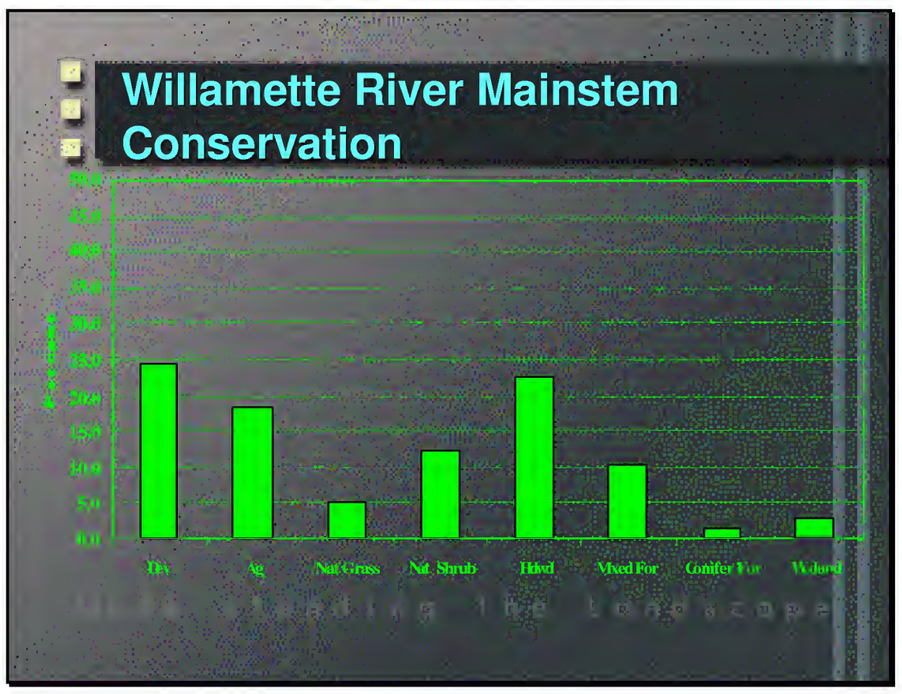

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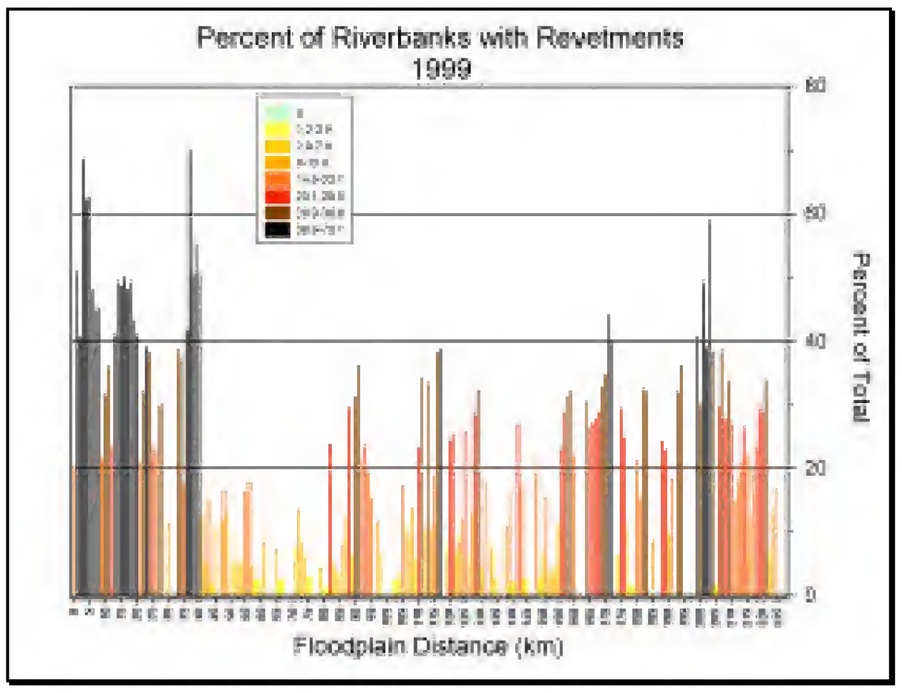

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Percent of River Length Revetted

- Both banks - 12%
- One bank - 14%
- No revetment - 74%
- 65% of meander bends revetted

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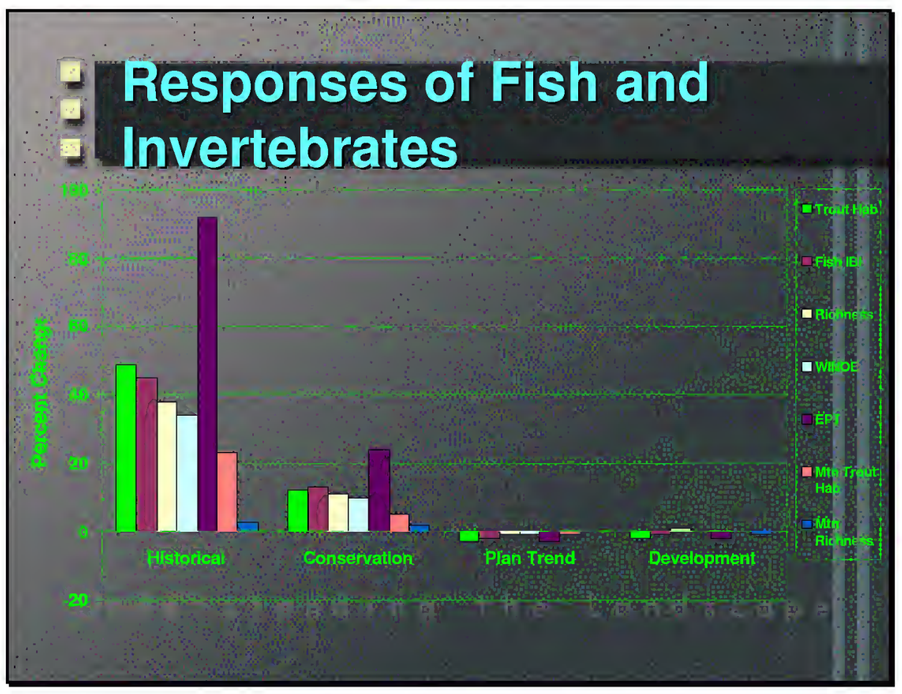

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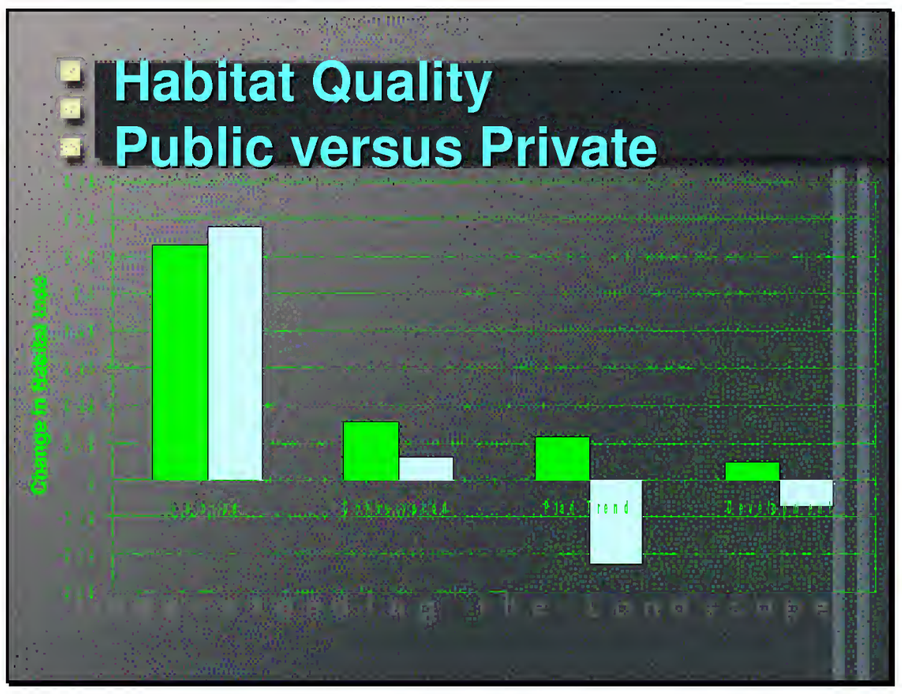

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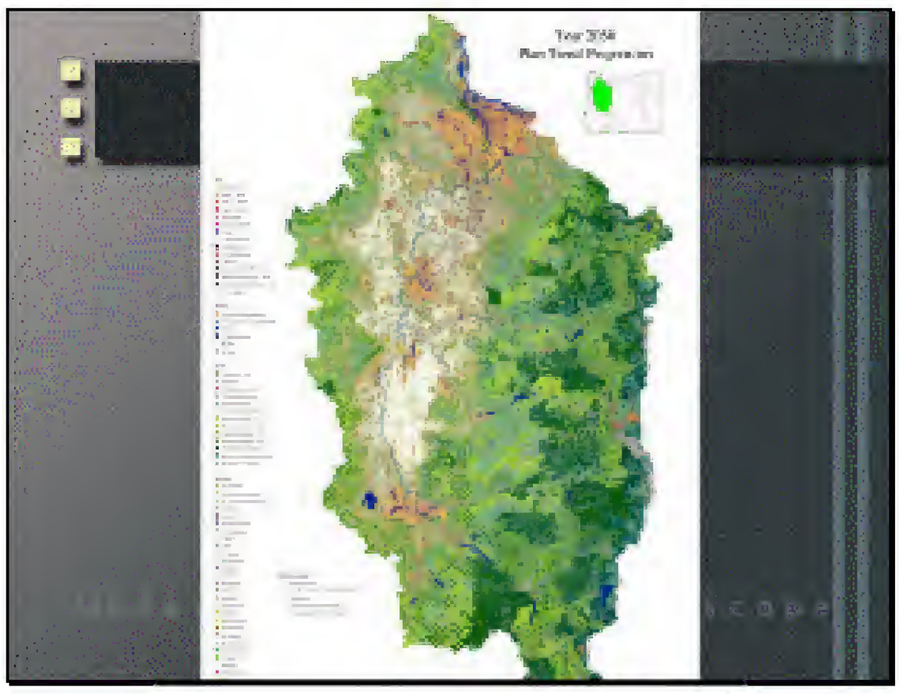

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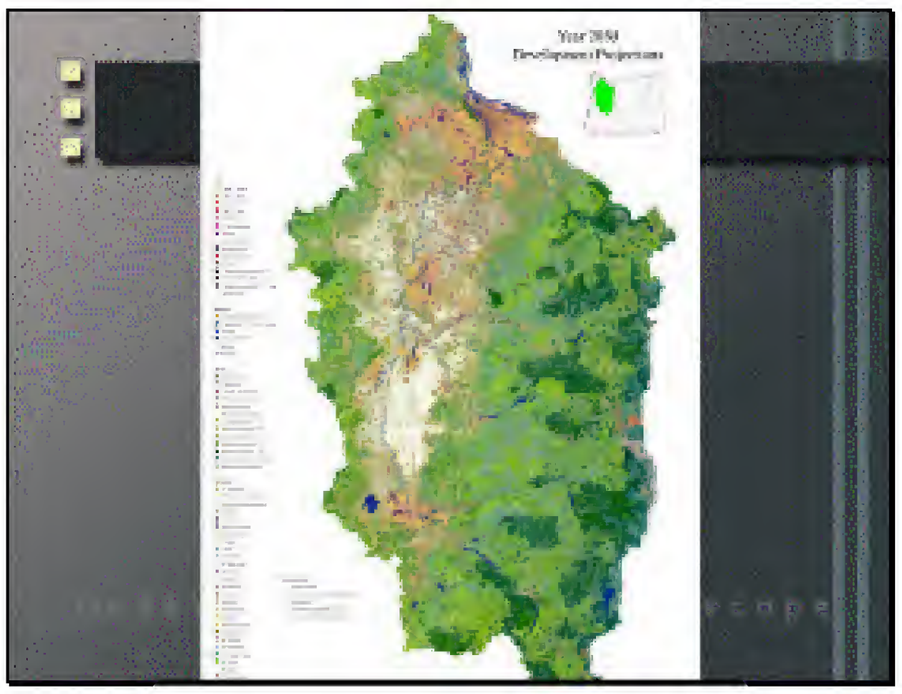

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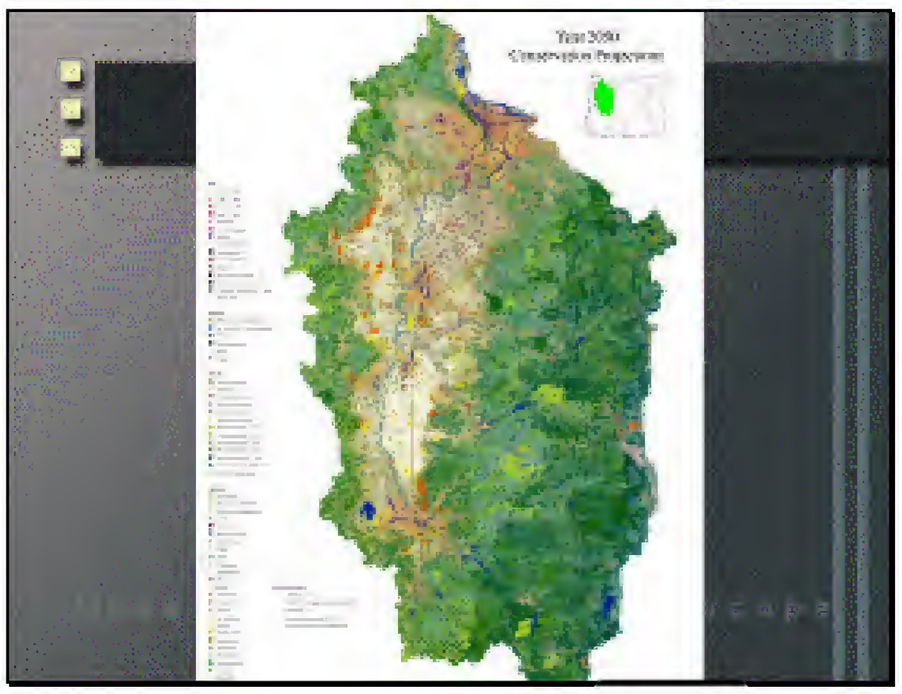

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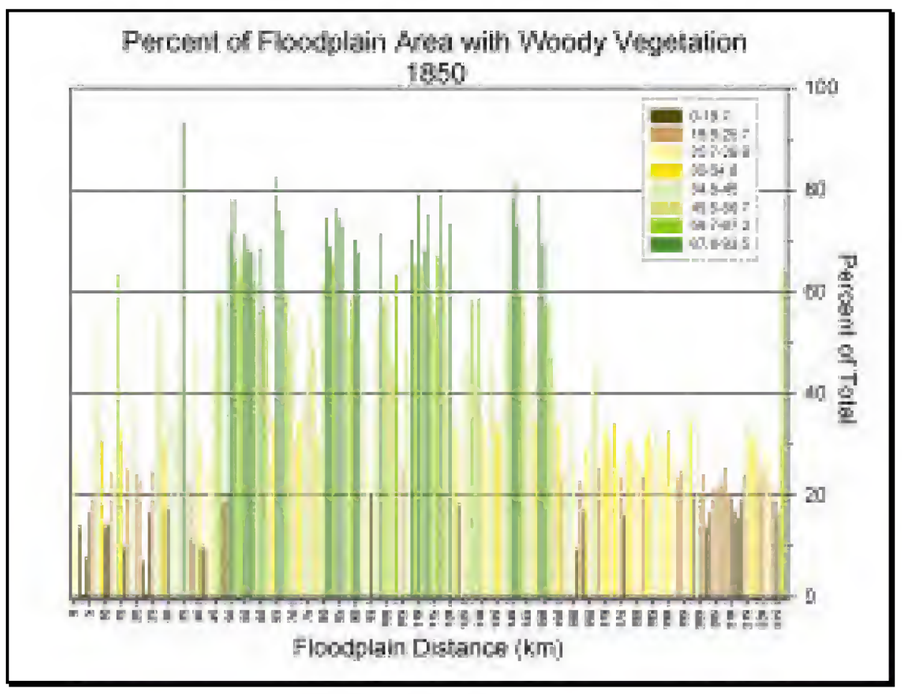

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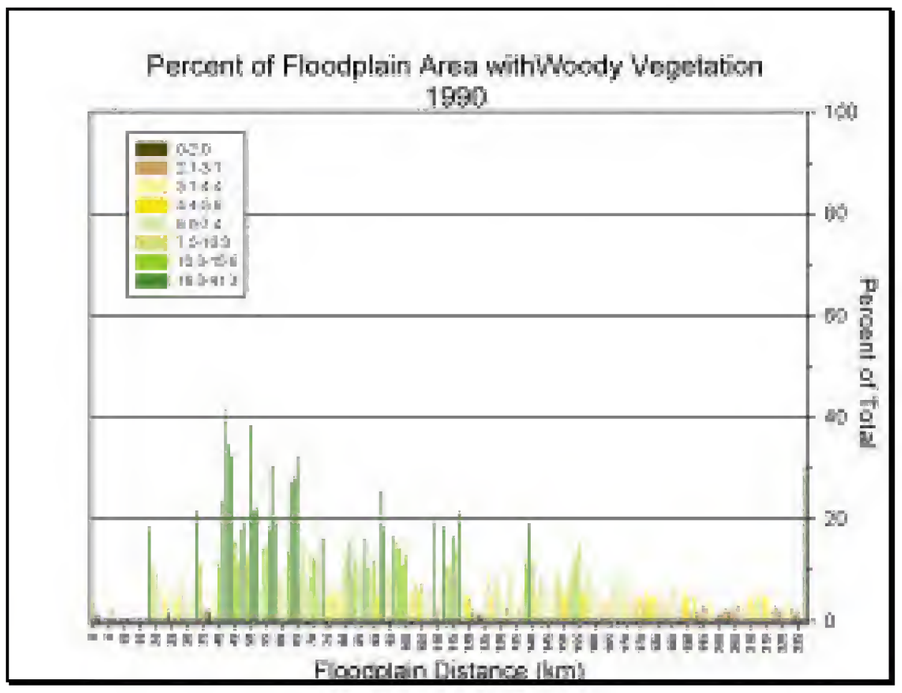

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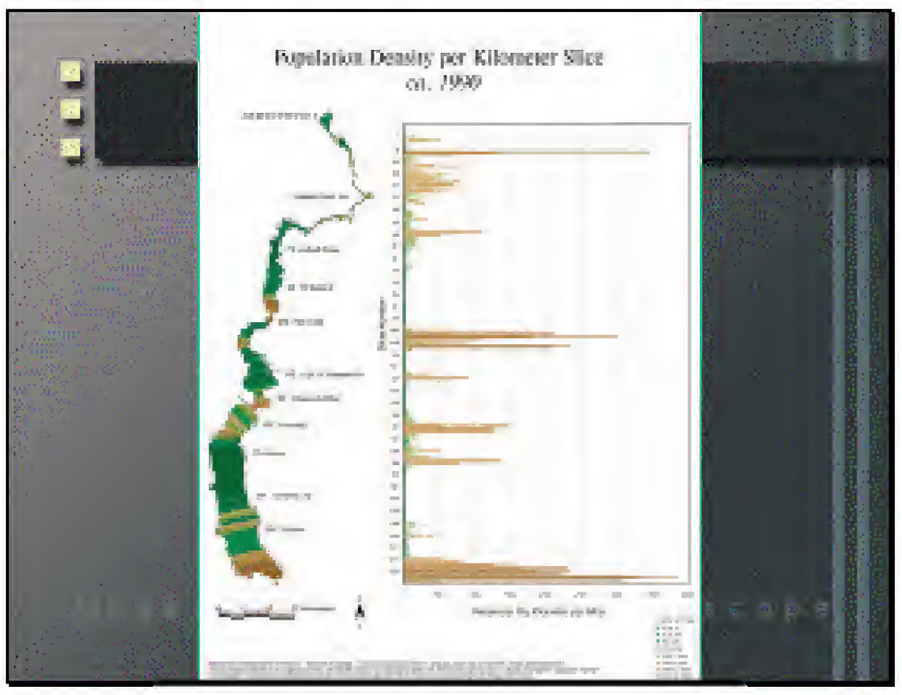

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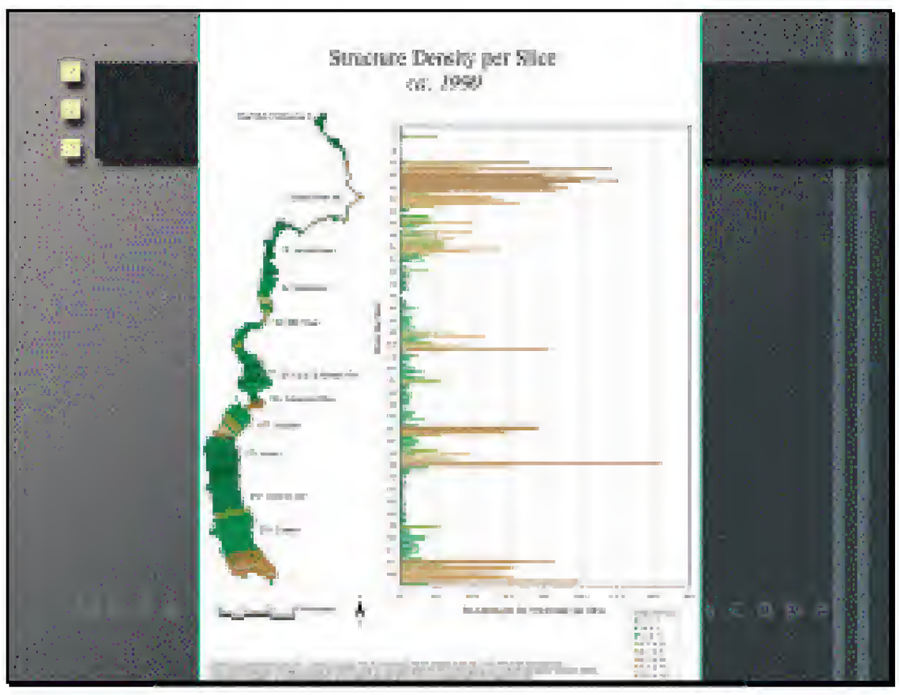

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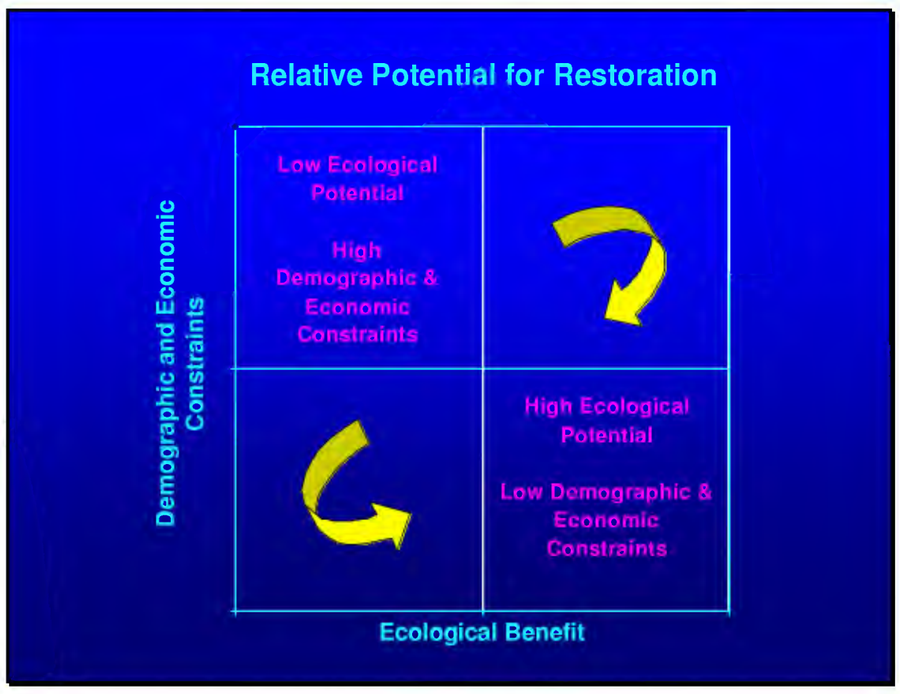

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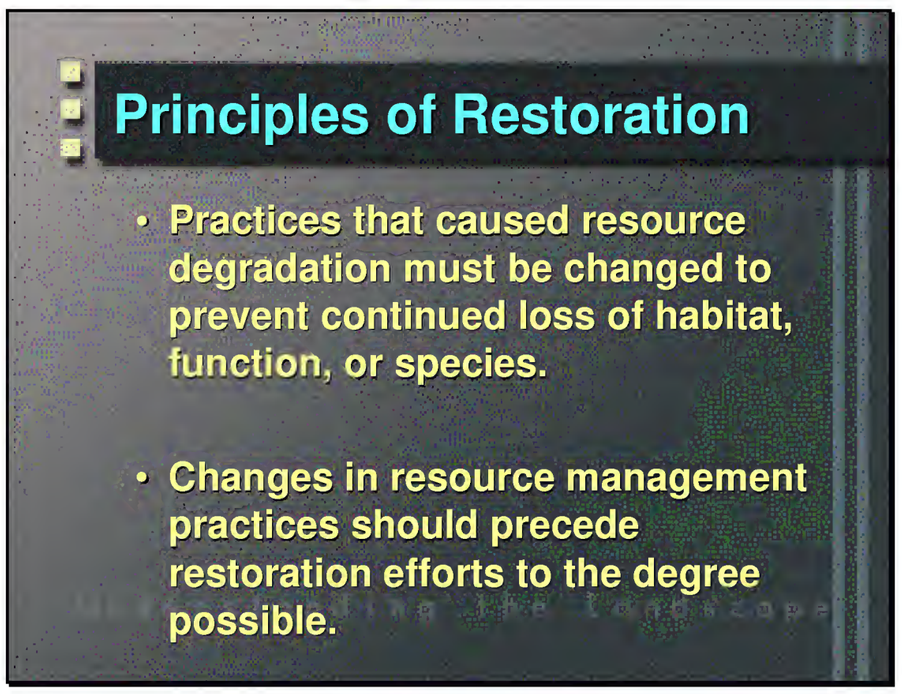

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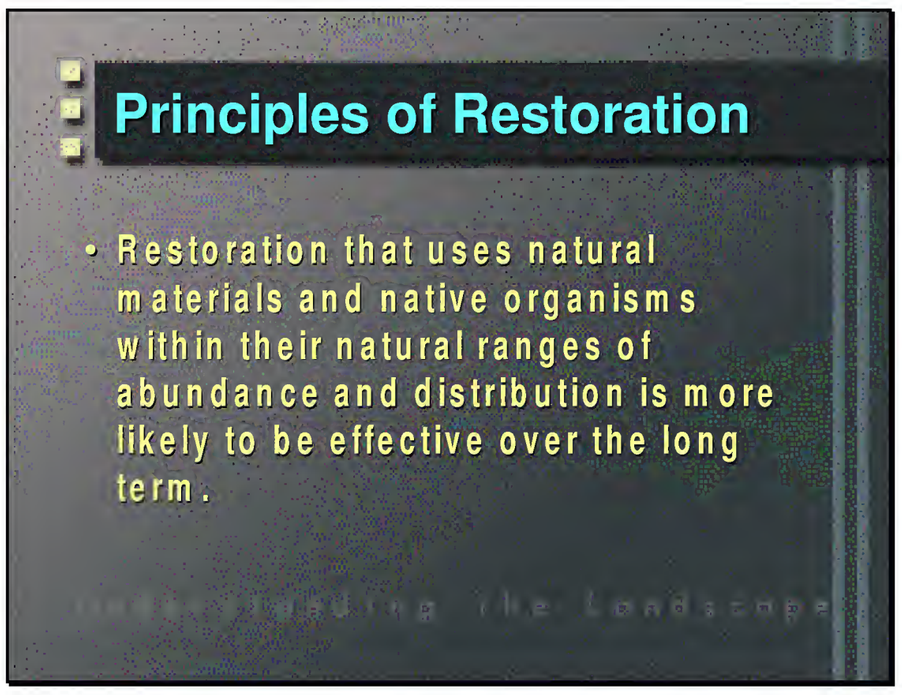

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Principles of Restoration

- Ecosystems are dynamic and changing.
- Restoration simply to a previous condition often is impossible or ecologically undesirable.

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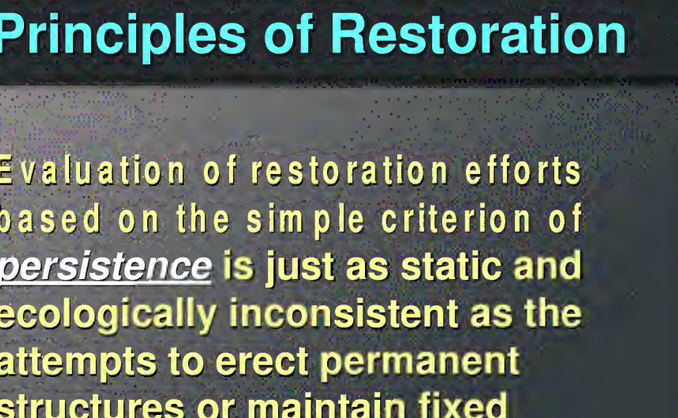
Principles of Restoration

- Evaluation of restoration efforts based on the simple criterion of ***persistence*** is just as static and ecologically inconsistent as the attempts to erect permanent structures or maintain fixed conditions.

Slide 44

Cutthroat Trout
Quartz Creek Restoration Experiment



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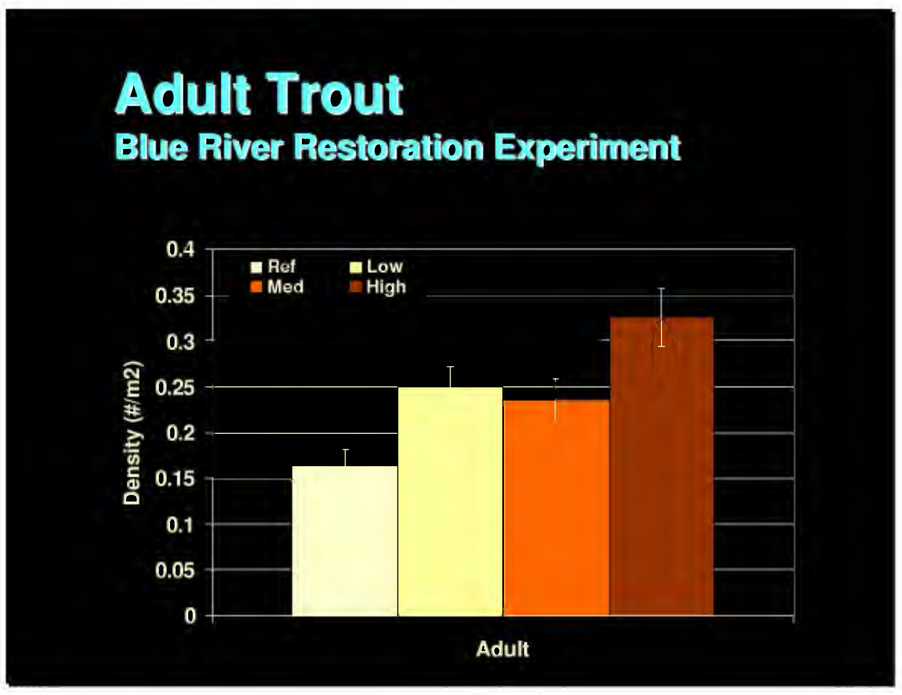

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Our Church of the Holy Restoration

- A tithing of even 10% of our collective resources to rigorous experimentation at appropriate scales would advance our knowledge and perhaps increase the effectiveness of future efforts to restore aquatic and terrestrial ecosystems.

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Historical Reconstruction of Landscapes

- Application to today's landscape and decisions about tomorrow
- Context
- Relation to management question
- Uncertainty
- Making decisions with imperfect information